



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|--|--------------|----------------------|---------------------|------------------|
| 10/578,619 | 05/08/2006 | O'Dae Kwon | KWON3008/REF | 3714 |
| 23364 | 7590 | 06/29/2007 | EXAMINER | |
| BACON & THOMAS, PLLC 625 SLATERS LANE FOURTH FLOOR ALEXANDRIA, VA 22314 | | | KING, JOSHUA | |
| ART UNIT | PAPER NUMBER | 2828 | | |
| MAIL DATE | | DELIVERY MODE | | |
| 06/29/2007 | | PAPER | | |

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

| | | |
|------------------------------|----------------------------|------------------|
| Office Action Summary | Application No. | Applicant(s) |
| | 10/578,619 | KWON ET AL. |
| | Examiner Joshua J. King | Art Unit 2828 |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) Responsive to communication(s) filed on 08 May 2006.
 2a) This action is FINAL. 2b) This action is non-final.
 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) Claim(s) 1-13 is/are pending in the application.
 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
 5) Claim(s) _____ is/are allowed.
 6) Claim(s) 1-13 is/are rejected.
 7) Claim(s) _____ is/are objected to.
 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) The specification is objected to by the Examiner.
 10) The drawing(s) filed on 08 May 2006 is/are: a) accepted or b) objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) All b) Some * c) None of:
 1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

| | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date <u>05/08/2006</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Priority

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Information Disclosure Statement

2. The information disclosure statement (IDS) submitted on May 08, 2006 was filed on the mailing date of the instant application on May 08, 2006. The submission is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Claim Objections

3. Claim 1 is objected to because of the following informalities: "the gain profile" lacks antecedent basis in the claim. Appropriate correction is required.
4. Claims 1-13 are objected to because of the following informalities: claims 1 and 9 contain multiple grammatical errors and should be carefully revised.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.
6. Claims 1-13 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. "multi-wavelength-oscillating in an envelope wavelength range" is not proper English and can not be understood as written. **For the purpose of this examination the examiner will read claim 1 as "...to adjust an**

inter-mode spacing of oscillation modes discretely oscillating at multiple wavelengths in a wavelength range within a gain profile of a given semiconductor material...". Furthermore, claim 1 and hence all the dependent claims are indefinite because "a maximal value" is indefinite because it does not provide a basis of comparison. **For the purpose of this examination "a maximal value" must be considered any value as long as there is some "spacing" between any modes.**

Claim 2 is indefinite for the same reason. It is not possible for the examiner to determine what a "minimal" number of modes are since there is no basis of comparison.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 1-6 and 9-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bae et al. (Photonic Quantum Corral, Carrier Ordering, and Photonic Quantum Dot/Ring Device) in view of Han et al. (InGaAs-AlGaAs-GaAs Strained-Layer Quantum-Well Heterostructure Circular Ring Lasers).

9. **Bae et al. discloses:**

- **With respect to claim 1,** a three-dimensional (3D) photonic quantum ring (PQR) laser (Fig. 4) for a low power consumption display, this is a recitation of intended use and since the laser of figure 4 emits light it can be used for as a display device, wherein the-PQR laser has a sufficient small radius to adjust an inter-

mode spacing (IMS) of oscillation modes discretely multi-wavelength-oscillating in an envelope wavelength range within the gain profile of a given semiconductor material of the PQR laser so that the IMS has a maximal value (Fig. 4).

- **With respect to claim 2**, wherein the adjustment of the IMS to the maximal value causes the number of the oscillation modes oscillating in the envelope to be adjusted to a minimal value (Fig. 4).
- **With respect to claim 3**, wherein the radius of the PQR laser is in a range of 15 μm to 2 μm depending on the structure and shape of the PQR laser and the semiconductor material (Fig. 6).
- **With respect to claim 9**, a three-dimensional (3D) photonic quantum ring (PQR) laser (Fig. 4) for a low power consumption display, this is a recitation of intended use and since the laser of figure 4 emits light, wherein the PQR laser has a sufficient small radius to adjust that the number of oscillation modes discretely multi-wavelength-oscillating in an envelope wavelength range within the gain profile of a given semiconductor material (Fig. 4) of the PQR laser has a value of 1.
- **With respect to claim 10**, wherein the radius of the PQR laser is in a range of 15 μm to 2 μm depending on the structure and shape of the PQR laser and the semiconductor material.

10. Bae et al. does not disclose:

- **With respect to claim 1**, the dependence of modal spacing on the radius of the ring lasers.

- **With respect to claims 4 and 11,** wherein the radius of the PQR laser is about 3 μm .
- **With respect to claims 5 and 6,** wherein the number of the oscillation modes of the PQR laser is has a value of 1.
- **With respect to claim 9,** the dependence of modal spacing on the radius of the ring lasers and the radius being lowered until only a single mode is present.

11. However, Han et al. discloses:

- **With respect to claim 1,** adjusting the radius of the ring lasers to adjust the modal spacing (817 introduction lines 12-18). The advantage is that by adjusting the radius the device can be optimized to emit at a pre-selected number of modes (817 introduction lines 12-18).
- **With respect to claim 4 and 11,** wherein the radius of the PQR laser is about 3 μm (817 introduction lines 12-18). It has already been established that the radius is adjusted to determine the modal spacing. Therefor, one of ordinary skill in the art would know to make the radius 3 μm to optimize the modal spacing.
- **With respect to claims 5 and 6,** wherein the number of the oscillation modes of the PQR laser is has a value of 1 (817 Introduction lines 12-18).
- **With respect to claim 9,** the dependence of modal spacing on the radius of the ring lasers and the radius being lowered until only a single mode is present (817 introduction lines 12-18).

12. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the device disclosed by Bae et al. with adjusting

the modal spacing by adjusting the radius as disclosed by Han et al. in order to optimize the device to emit at a pre-selected number of modes.

13. Claims 7 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bae et al. (Photonic Quantum Corral, Carrier Ordering, and Photonic Quantum Dot/Ring Device) in view of Han et al. (InGaAs-AlGaAs-GaAs Strained-Layer Quantum-Well Heterostructure Circular Ring Lasers) as applied to claims 1 and 9 respectively above, and further in view of Grillot et al. (U.S. Patent Number 6,504,171).

14. Bae et al. in view of Han et al. do not disclose:

- **With respect to claims 7 and 12**, wherein the PQR laser oscillates in an oscillation wavelength band corresponding to one of red (R), green (G), and blue (B), to thereby emit corresponding colors therefrom.

15. However, Grillot et al. discloses:

- **With respect to claims 7 and 12**, wherein the PQR laser oscillates in an oscillation wavelength band corresponding to one of red (R), green (G), and blue (B), to thereby emit corresponding colors therefrom (column 11 lines 17-19). The advantage is to tune the light the laser can produce (column 11 lines 22-24).
- **With respect to claims 8 and 13**, which oscillate in a wavelength band corresponding blue color, is coated with a material to generate a PQR spectrum having white color.

16. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have further modified the device disclosed by Bae et al. in view

of Han et al. with the device emitting red, green or blue light as disclosed by Grillot et al. in order to optimize the light for a specific use.

17. Claims 8 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bae et al. (Photonic Quantum Corral, Carrier Ordering, and Photonic Quantum Dot/Ring Device) in view of Han et al. (InGaAs-AlGaAs-GaAs Strained-Layer Quantum-Well Heterostructure Circular Ring Lasers) in view of Grillot et al. (U.S. Patent Number 6,504,171) as applied to claims 7 and 12 respectively above, and further in view of (U.S. Pre-Grant Publication 2004/0169181).

18. Bae et al. in view of Han et al. in view of Grillot et al. does not disclose:

- **With respect to claims 8 and 13,** which oscillate in a wavelength band corresponding blue color, is coated with a material to generate a PQR spectrum having white color.

19. However, Yoo (U.S. Pre-Grant Publication 2004/0169181):

- **With respect to claims 8 and 13,** which oscillate in a wavelength band corresponding blue color, is coated with a material to generate a PQR spectrum having white color (claim 5). The advantage is that white light is produced (claim 5).

20. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have further modified the device disclosed by Bae et al. in view of Han et al. in view of Grillot et al. with the coating on the blue wavelength laser as disclosed by Yoo in order to produce white light.

Conclusion

21. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Kwon et al. (U.S. Pre-Grant Publication 2002/0024980) discloses a PQR laser. Furukawa (U.S. patent Number 6,282,226) discloses a 3D ring laser. McCall (U.S. Patent Number 5,343,490) discloses a whispering mode micro-resonator. Park et al. (Chiral wave propagation manifold of the photonic quantum-ring laser) discloses inter-mode spacing dependent on radius. Armani et al. (Ultra-high-Q toroid microcavity on a chip) discloses a ring laser. Bae et al. (Spectrum of three-dimensional photonic quantum-ring microdisk cavities: comparison between theory and experiment) discloses a PQR laser and its properties. Park et al. (Evanescent and propagating wave characteristics of the photonic quantum ring laser) discloses a PQR laser and its properties.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Joshua J. King whose telephone number is 571-270-1441. The examiner can normally be reached on Mon.-Thurs. 10:00-7:30 and every other Fri. 10:00-6:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Min Sun Harvey can be reached on 571-272-1835. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JJK 06/19/2007

MINSUN OH HARVEY
PRIMARY EXAMINER